OVERVIEW

Liquidity in a time of financial turbulences

Liquidity is an elusive notion. "*It is easier to recognize than to define*".[1]

Three basic definitions are commonly used: (1) the liquidity of financial instruments reflects the ease with which they can be exchanged for money without loss of value; (2) a related concept is market liquidity defined as the market's ability to trade a given volume of assets or securities without significantly affecting their prices; (3) finally, monetary liquidity pertains to the quantity of fully liquid assets circulating in the economy. It is usually measured by a narrow or broad monetary aggregate or its ratio to nominal GDP.

Several other concepts exist, including funding liquidity, *i.e.* the ease with which economic agents can obtain external finance; balance sheet liquidity, *i.e.* the amount of liquid assets on the balance sheets of non financial institutions; and, for financial institutions, bank liquidity, *i.e.* the ability of a bank to meet its immediate commitments. All of these concepts are distinct from one another. They are also closely interrelated but in a rather complex way.

Liquidity shocks appear at the heart of the current financial turmoil. Market liquidity has been severely impaired in many occasions, most notably on some segments of the commercial paper market (asset-backed commercial paper –ABCP) as well as on inter-bank markets. But events are still unfolding. Capital losses and shortages have also appeared in a number of major financial institutions.

It is not clear today whether liquidity tensions are the main cause and source of the difficulties or simply a symptom of deeper structural changes and pressures in the financial system. To try and answer that question, it is worth stepping back and taking a look at the transformation of financial markets over the last decade and their impact on liquidity.

For the purpose of analysis, it may be useful to contrast schematically two visions of the world: the "old" and the "new". The "old" world features a fully bank-intermediated system in which banks are the only entities to undertake financial intermediation and assets are valued at historical cost, with depreciation taking place according to pre-set rules and judgments. By contrast, in the "new" world of securitised finance, most financial intermediation takes place in the markets, through the trading of securities. And positions and securities are marked to market (or according to fair value) in the books of financial intermediaries.

Thus, the old and new worlds differ both in their intermediation channels and valuation methods. Note that those two features are closely related. Marking to market –at least in its purest form– depends on the availability of reliable prices in deep and liquid markets. Conversely, if such markets exist, there is no justification for valuing traded securities at a level different from prices which can be observed when transactions occur.

The "two worlds" share common features: in both bank and market-based intermediation, shocks can occur due, for instance, to an abrupt change in the demand for liquidity. "Bank runs" happen when depositors start having doubts on the solvency of the institution and rush to withdraw their deposits, thereby creating or aggravating the bank's liquidity shortage. Similarly, doubts on the value of underlying assets can lead to a collapse of demand on short term securities issued by a financial intermediary, triggering a liquidity crisis. Both phenomenons have been observed since the beginning of the current turmoil.

Those shocks, whether they take place in a bank or market-based systems, appear as a result of co-ordination failures between depositors or investors, whereas individual actions, by themselves fully rational, create unsustainable situations. Fundamentally sound institutions can suddenly become insolvent if they have to liquidate assets at fire-sale prices in order to meet their liquidity requirements. This illustrates the fundamental endogeneity of liquidity, which depends on confidence, *i.e.* the ability of depositors, institutions, and market participants to take risks on each other. Hence the possibility of multiple

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1 *Andrew Crockett in this issue of the* Financial Stability Review.

equilibriums, with very different possible levels of liquidity demand for the same economic situation. The "jump" from one equilibrium to another is what defines a liquidity crisis.

LIQUIDITY IN THE "NEW" WORLD OF SECURITISED FINANCE

The far-reaching transformations taking place in financial markets over the past decade have changed the contour of liquidity. Nowadays, a significant part of market liquidity creation lies outside the banking system. Alongside the traditional bank-mediated liquidity, there is a second and growing component which depends on the amount of credit that financial intermediaries are willing to extend to each other. As a consequence, market participants are more dependent on market liquidity; there is a close interaction between liquidity and valuation; new contagion channels have appeared; and, finally, uncertainty has a bigger impact than before on market and funding liquidity.

A greater dependence on market liquidity

Securitisation both enhances and relies on liquidity. On the one hand, it enhances the liquidity of underlying receivables by transforming them into tradable securities. On the other hand, the funding of a large number of market participants involved in the securitisation process depends crucially on market liquidity being permanently sustained.

This has shown to be particularly the case for conduits and structured finance vehicles (SIVs) which have been built on the premises of continuous liquidity (reaping the benefits in terms of maturity spreads).

Banks themselves have ceased to be simple providers but also become users of market liquidity. Obviously, many market participants, including market brokers and hedge funds, are dependant on liquidity facilities provided by banks. But banks themselves, especially investment banks, rely permanently on the issuance of securities for funding their financing needs. Market liquidity also impacts the asset side of their balance sheets to the extent they want to actively manage their portfolios.

For all market participants, the dynamic hedging of risks typically involves the continuous buying and selling of short and long term securities. Illiquidity of markets can thus have enormous consequences on solvency if it prevents a normal management of risky positions.

Interaction between liquidity, valuation and solvency

A major break between the "old" and "new" world is the dynamic interaction between liquidity and solvency through the valuation process of securitised assets.

At any moment in time, asset prices depend both on the expected cash flow they generate and the underlying liquidity of the market on which they are traded. In normal times, when liquidity is abundant, fundamentals prevail. However, in times of stress, the price of an asset is more a reflection of the degree of liquidity shortage than of the asset's intrinsic expected pay-offs. Overall market liquidity determines the price level for each individual security.

With mark to market accounting, changes in asset prices quickly show up on balance sheets and have an immediate impact on the net worth of all the components of the financial system. It follows that, in times of stress, liquidity movements immediately translate into changes in the equity base of banks and financial intermediaries. This may transform liquidity shocks into solvency shocks, independently of any "run", as the current market value of an institution falls in response to a tightening of market liquidity. In turn, those changes in the equity base of banks, if perceived as threatening their ultimate solvency, will reduce and cut off their access to funding.

New contagion channels

Market liquidity affects all participants. It may act as a powerful contagion channel when its fluctuations trigger discrete moves in asset prices, followed by an abrupt expansion or contraction in the capital base of financial institutions; and finally, in a feedback loop, an increase or decrease in their ability to provide liquidity to the market.

Adrian and Shin[2] show that this contagion effect is amplified when financial institutions manage actively their balance sheets. Leverage tends to be pro-cyclical, increasing the amplitude of the shocks to the financial system. Also, as opposed to the "domino" model, where contagion occurs slowly through depreciation of assets, marking to market elicits immediate response to price changes by market participants, and speedy transmission between financial intermediaries.

A bigger impact of uncertainty

Following the classical distinction introduced by Knight, uncertainty –as opposed to risk– may be defined as a situation where no probability distribution can be attached to the underlying set of outcomes and risks.

Uncertainty can affect liquidity through two channels: its impact on information; its influence on market dynamics.

Liquidity depends on information. On "perfect" and complete markets, with comprehensive information available to all market participants, and a full set of state-contingent securities, there is no liquidity problem. Assets can be traded at their "fundamental" value; any solvent institution will always be properly funded and risks can always be priced and distributed to those agents most equipped to carry them.

However, markets are not perfect. There are information asymmetries whereby borrowers (issuers of securities) know more about the risks than lenders (or buyers of securities). So market participants may be reluctant to trade in those assets whose characteristics and behaviour under changing economic conditions are not well known. In times of stress, when uncertainty increases, all trades could become impossible and market liquidity dries up. *"Market liquidity is inversely related to the degree of information asymmetry prevailing among economic agents; as shown by Akerlof in his celebrated analysis of the 'market for lemons', a market may altogether disappear (the most extreme form of illiquidity) if information is sufficiently asymmetric".*[3]

Banks are well equipped to eliminate and reduce information asymmetry through the continuous relationship they keep with their clients and borrowers. By contrast, information asymmetry is especially pervasive in modern securitised markets and structured finance.

First, innovation creates by itself uncertainty on asset valuation. The bulk of structured finance instruments are not really traded in secondary markets. They are built so as to precisely suit the characteristics and the risk profile required by investors. Therefore, their valuation tends to rely on a combination of credit pricing models and thinly traded derivatives. Very often, "mark to market" boils down, in fact, to "mark to model". Model complexity makes it more difficult for investors to understand the intrinsic properties of assets and measure how their value will change in response to shocks. In addition, the more recent the product, the shorter the time series used to measure historical correlations and quantify risks, the more uncertain the valuation.

Second, with "mark to market", any uncertainty on asset values immediately transforms into an uncertainty on the solvency of those financial institutions.

This amplifies liquidity problems. Ultimately, liquidity depends on the ability and the willingness of market participants to take risks *vis-à-vis* one another: the soundness of agents' balance sheets will determine their credibility as counterparties and therefore their ability to trade and provide liquidity. But it is strikingly difficult to assess the creditworthiness of an agent in a context of increased uncertainty regarding the valuation of its balance sheet.

To some extent, problems of uncertainty and information asymmetries were "masked" by the rating process. There was a perception that identifiable default probabilities and "loss given default" existed for structured products, with the same distribution and sensitivity to shocks as "plain vanilla" securities. In other words, rating transformed uncertainty into "risk". Rating agencies were fully transparent about their methodology. Nevertheless, there has been a deep misunderstanding as to the scope and true meaning of ratings for structured products, which may have been encouraged by the use of only one set of metrics for both structured and "plain vanilla" products.

2 *See Adrian and Shin in this issue of the* Financial Stability Review.
3 *Lorenzo Bini Smaghi, "Remarks at the Euro50-Natixis breakfast seminar", Washington DC, 21 October 2007.*

Beyond information, uncertainty also affects market dynamics. A key mechanism insuring market liquidity is the existence of informed investors willing to take risks to buy (or sell) assets which they find under (or over) valued; and, by doing so, to prevent "one sided" markets to develop into a spiral of excess volatility and low liquidity. This mechanism, however, relies upon the ability of investors to value assets with sufficient confidence and certainty. If uncertainty on valuation is too high, investors will stand by and wait, allowing liquidity to vanish in a cumulative process of market contraction and capital. Uncertainty may thus prevent the emergence of market clearing prices for complex securities. The bigger the uncertainty, the more protracted the adjustment process and the higher the risk of overshooting with significant damage to the financial system.

THE INTER-BANK MARKETS

One major surprise of the last period of turbulences has been the amplitude and rapidity of their transmission to the very "core" of the financial system, *i.e.* the inter-bank market. It is certainly too early to provide a full and comprehensive explanation. Nevertheless, the complex interactions between uncertainty and liquidity provide some insights on why the inter-bank markets were hit so hard and so fast.

Uncertainty comes in two forms:[4] fundamental uncertainty, which affects the quality and value of assets; and strategic uncertainty, stemming from ignorance of what other market participants will do in specific situations. Those two uncertainties help to formulate two tentative explanations, which are not mutually exclusive and, indeed, may interact with each other to create a dynamic.

The apparition of "fundamental" uncertainty –*i.e.* the sudden impossibility to attach probabilities to the different states of the world– can trigger a "regime shift".[5] Market participants will no longer optimise their behaviour according to pre-set strategies. Instead, they may resort to "maximin" criteria, whereby they make decisions based on worst-case scenarios. Banks will therefore tend to hoard maximum liquidity, whatever its costs, to be able to meet any contingency, however improbable, regarding their own future liquidity needs and risk exposure.

It could be argued that such precautions are unnecessary and costly since, if worst case scenarios materialise, banks can always access to exceptional central banks facilities: discount windows, marginal lending facility or emergency liquidity assistance. Recent events have shown, however, that there is great reluctance on the part of banks to use some of those facilities by fear of "signalling" their difficulties to other market participants. This stigma attached to the use of central banks' facilities can be best explained in terms of "strategic" uncertainty (see box below).

One conjecture, developed in the attached box, would run as follows. Under the pressure of intense competition, banks would try and gain advantage in ordinary times through tight and sophisticated risk management and hedging strategies, in particular with respect to liquidity risk. When a crisis erupts, some of those strategies become more vulnerable than others. Market participants are aware of this, but cannot exactly pinpoint which institutions are most negatively affected, because individual hedging strategies are unobservable.[6] This information asymmetry creates the risk of adverse selection and a general loss of confidence. Banks with excess liquidity will keep it, in order to reap the benefits of their superior hedging strategies. Banks with liquidity needs would do everything to avoid signalling their weaknesses. As a result, the functioning of the inter-bank market may be severely impaired.

4 *See Rochet in this issue of the* Financial Stability Review.
5 *See for instance Adrian and Shin in this issue of the* Financial Stability Review.
6 *See for instance Adam, Dasgupta and Titman (2008): "Financial Constraints, Competition and Hedging", forthcoming,* Journal of Finance.

Competition and liquidity crises

Strategic behaviours in relation to imperfect competition have been highlighted by some market participants as a possible explanation for tensions in the inter-bank market: some banks may have been reluctant to lend short-term liquidity in order to restore their own market power by weakening their competitors.

The link between competition and liquidity crises can be formalised through various approaches: the degree of competition in the banking sector can affect hedging decisions (with respect to liquidity risk), both in terms of the overall level of liquidity provisioning, and in terms of dispersion in hedging strategies.

- *Banks may compete more aggressively* ex ante *so as to lock in a larger number of customers whose future liquidity needs constitute future income. Higher competition tends to increase the volume of capital dedicated to illiquid loans. This mechanically reduces the optimal share of liquid assets. Through this negative effect, competition tends to worsen the risk profile of the pool of liquidity applicants: banks that are short of liquidity make fewer monitoring efforts as they reinvest less of their own liquidity in risky projects. The risk profile of the pool of liquidity applicants may deteriorate to the point that banks with excess liquidity prefer to hoard it (at the central bank) rather than lend it on the inter-bank market: the market for liquidity then collapses.*

- *There is an alternative mechanism by which competition may amplify adverse selection. Recent literature shows that more competitive industries exhibit higher heterogeneity in hedging. Since hedging decisions are imperfectly observable, competition may therefore contribute to amplify an adverse selection problem on the inter-bank market.*

These two examples show that competition may, in some circumstances, participate in creating the preconditions for a liquidity crisis. However, competition is known to have powerful benefits in terms of reducing the cost of capital. The extent to which the former effect may significantly mitigate the later in welfare terms remains an open question.

SHOULD LIQUIDITY REGULATION BE STRENGTHENED?

In times of intense liquidity stress, it is only natural that questions be raised about the adequacy of existing liquidity rules and regulations for banks and other financial intermediaries. Most of those rules date back to more than a decade ago, a fact which, by itself, would warrant a full review. The precise policy response, however, crucially depends on the diagnosis on the origins and roots of the current turmoil.

The case for stronger regulation on liquidity rests on three arguments.

First, pure market failures.[7] There are no incentives for banks to hold adequate amounts of liquid assets because: (1) liquidity is costly, especially when competition drives the search for higher returns on equity; (2) liquidity shortages are very low probability events; (3) there is a perception that central banks will step in and provide liquidity support if and when it is needed (the moral hazard argument).

Second, liquidity requirements can be seen as a way of sharing the cost of the "public good" of liquidity and financial stability between the private and the public sectors. This would help and mitigate moral hazard; it would also compensate for other implicit subsidies, such as deposit insurance, granted to the banking sector.

Finally, stronger liquidity requirements would reduce the strategic uncertainty affecting banks actions, since they would be able to withstand larger shocks.[8]

7 *See Financial Services Authority (2007): "Review of the liquidity requirements for banks and building societies", Discussion paper 07/7, December.*
8 *See Rochet in this issue of the* Financial Stability Review.

On the other hand, one could observe that the same arguments –especially relating to market failures– could be made in favour of stronger capital, rather than liquidity, requirements. Also, it is not clear that bigger liquidity cushions would help in times of crisis since, as already mentioned, the potential demand for liquidity is almost infinite in those circumstances. In addition, as Charles Goodhart neatly points out,[9] there may be occasions where required liquidity would not necessarily correspond to usable liquidity.

It may be that increasing the resilience of the financial system would necessitate a broader approach. Apart from strengthening liquidity cushions, it may appear appropriate to limit the probability of liquidity shortages incurring in the future. This would mean first, reducing uncertainty and second, improving the robustness of financial institutions.

A reduction of uncertainty could be brought about through standardisation of securitized products and improvements in the rating system, in order to eliminate information asymmetries.

Increasing the robustness of financial institutions obviously raises the question of capital adequacy. In the "new" world with mark-to-market, the distinction between liquidity and solvency is increasingly blurred. In addition, the ability of investors to carry risk –one important determinant of their exposure to liquidity shortages– is determined by their capital base. The turmoil has revealed the importance taken by off-balance sheet exposures of large institutions in relation to their capital.

It remains difficult, however, to find the appropriate balance between several conflicting objectives. Product standardisation may come at the expense of financial innovation. By the same token, too stringent capital requirements would reduce the return on financial activities and may be circumvented. It may therefore take sometime before all the lessons of the current episode can appropriately be drawn.

9 *In his article entitled "Liquidity risk management" in this issue of the* Financial Stability Review, *Goodhart uses the metaphor of* "the weary traveler who arrives at the railway station late at night, and, to his delight, sees a taxi there who could take him to his distant destination. He hails the taxi, but the taxi driver replies that he cannot take him, since local bylaws require that there must always be one taxi standing ready at the station".